Claims

1. A process for producing a fibrous material, comprising a lignocellulosic material with phenolic or similar structural groups, and a signalling agent, said process comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material, and
- contacting the oxidized fibre material with a signalling agent containing at least one first functional group or portion, which is compatible with the oxidized fibre material, said signalling agent being capable of providing the lignocellulosic fibre material with properties foreign to the native fibre.

2. A process for producing a fibrous material, comprising a lignocellulosic material with phenolic or similar structural groups, and a signalling agent, said process comprising the steps of

- oxidizing phenolic or similar structural groups of the lignocellulosic matric to provide an oxidized fibre material, and
- contacting the oxidized fibre material with a modifying agent containing at least one first functional group or portion, which is compatible with the oxidized fibre material, and at least one second functional group in order to provide a lignocellulosic fibre material having a modified surface,
- contacting the thus modified lignocellulosic fibre material with a signalling agent, and
- bonding the signalling to the modified surface of the fibre material in order to impart to the fibre material new functional properties derivable from the signalling agent.

3. The process according to claim 1 or 2, wherein the lignocellulosic fibrous matrix is reacted with an oxidizing agent in the presence of a substance capable of catalyzing the oxidation of phenolic or similar structural groups by said oxidizing agent.

4. The process according to any of claims 1 to 3, wherein the signalling agent is activated with an oxidizing agent.

5. The process according to any of claims 1 to 4, wherein the signalling agents are selected from the group comprising security components, such as fluorescent compounds verifiable under UV light from scanners, metallic particles or chemical security features and machine-readable pigments.

6. The process according to claim 5, wherein the signalling agents is selected from the group of thermochromes, photochromes, electrically conductive substances, including electrically conductive polymers, radioactive compounds, fluorescent compounds, luminescent compounds and various inorganic compounds.

7. The process according to any of claims 1 to 6, wherein the signalling agent exhibits at least one functional site, which is compatible with the fibrous matrix or with the modifying agent in order to achieve covalent or physical bonding of the signaling agent to the ligno-cellulosic material.

8. The process according to claim 7, wherein the functional site comprises reactive groups selected from hydroxy, carboxy, anhydride, aldehyde, ketone, amino, amine, amide, imine, imidine and derivatives and salts thereof.

9. The process according to any of claim 1 to 8, wherein the signalling agent can be detected by visual colour change, laser, magnetics, conductivity, microwaves, ultrasonic, infrared, mass spectrometry, gas chromatography, physical agents, or combinations thereof.

10. The process according to any of claims 2 to 9, wherein the modifying compound is a bifunctional compound containing at least one first functional portion or group and at least one second functional group, the second functional group being selected from the group of hydroxyl (including phenolic hydroxy groups), carboxy, anhydride, aldehyde, ketone, amino, amine, amide, imine, imidine and derivatives and salts thereof.

11. The process according to any of claims 2 to 10, wherein the modifying compound is a bifunctional compound containing at least one first functional portion or group and at least one second functional group, the first functional group being selected from the group of

hydroxy, carboxy, anhydride, aldehyde, ketone, amino, amine, amide, imine, imidine and derivatives and salts thereof.

12. The process according to any of the claims 1 to 11, wherein the substance capable of catalyzing the oxidation of phenolic or similar structural groups is an enzyme or a chemical agent or a radiation agent.

13. The process according to claim 12, wherein the enzyme capable of catalyzing the oxidation of phenolic or similar structural groups is selected from the group of peroxidases and oxidases.

14. The process according to claim 13, wherein the enzyme is selected the group of laccases (EC 1.10.3.2), catechol oxidases (EC 1.10.3.1), tyrosinases (EC 1.14.18.1), bilirubin oxidases (EC 1.3.3.5), horseradish peroxidase (EC 1.11.1.7), manganase peroxidase (EC 1.11.1.13) and lignin peroxidase (EC 1.11.1.14).

15. The process according to any of claims 1 to 14, wherein the enzyme dosage is about 1 to 100,000 nkat/g, preferably 10-500 nkat/g, and it is employed in an amount of 0.0001 to 10 mg protein/g of dry matter.

16. The process according to claim 12, wherein the chemical agent is selected from the group of per-compounds, in particular from the group consisting of alkali metal persulphates and hydrogen peroxide.

17. The process according to any of the preceding claims, wherein the oxidizing agent is selected from the group of oxygen, hydrogen peroxide and oxygen-containing gases, such as air.

18. The process according to any of the preceding claims, wherein oxygen or oxygen-containing gas is introduced into the aqueous slurry during the reaction.

19. The process according to any of the preceding claims, wherein the reaction of step (a) is carried out in an aqueous or dry phase at a consistency of 1 to 95 % by weight, preferably about 2 to 40 % by weight, of the fibre material.

20. The process according to any of the preceding claims, wherein the reaction is carried out at a temperature in the range of from 5 to 100 °C